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only to rejoice in the growing light of chemistry and biology, but, quickened by their warmth, to put forth new life and vigor, and to apply to their investigations the most refined instrumentalities and the most subtle thought; believing with Lord Lytton that man is a subject of far nobler contemplation, of far more glowing hope, of a far purer and loftier vein of sentiment, than all the 'floods and fells' in the universe.

PAPERS READ BEFORE SECTION H.

(MOUNDS AND MOUND-BUILDERS.)

The great mounds of Cahokia.

BY WILLIAM McADAMS OF ALTON, ILL.

THE mounds referred to are in the locality known as the 'American bottom.' The region so called is a strip of alluvial land in the state of Illinois, lying between the bluff and the Mississippi river, and extending from the city of Alton to a point below the city of East St. Louis. A map of the locality, showing the places and dimensions of the mounds, was exhibited before the section. The mounds are over two hundred in number, and are the largest in the United States. A group of seventy-two mounds on the Cahokia creek was specially considered. The central mound of the group is the largest: it is a hundred feet high, and covers fourteen acres of ground. It is a truncated pyramid with two terraces: its flat top has an area of one and a half acres. The surrounding mounds are thirty to forty feet high: they are square, in this respect differing from the conical mounds of Ohio. The mounds on the bluff seem to be of a different order, being only four or five feet high, and round or oval. Unquestionably the mounds of the Cahokia valley are artificial, being made of black alluvial earth, entirely different from the ground on which they rest.

The author accounted for the fact that there were few mounds on the banks of the Mississippi river, by supposing that the mound-builders were afraid of their enemies beyond the stream.

Numbers of relics have been found in the Cahokia mounds, mostly of flint, some of them eighteen inches long. The finest is a white flint axe, which is of a smoothness and polish like ivory. In reply to an inquiry, the author stated that there had been considerable alluvial deposit formed since the mounds were built. The subsoil is a yellow clay loam: under the mounds is a floor of white sand.

In discussing the paper, Gov. Bross stated that he had discovered, on the top of the only round mound of the group, a large flat stone, which he thought might have been used for sacrificial purposes. A skeleton had been found, of a man more than six feet high: the whole series of mounds gave evidence of the energy and industry the men of that time had possessed. Dr. Hoy said that there was in Africa a mere bird that threw up a mound fifteen feet high, so that these men might not have been even large. Mr. Putnam expressed the opinion that the mounds

were simply a site for a town, and not a worshipping-place. Mr. McAdams said he had been led to believe they were places of worship, by the use of just such mounds for places of worship in Mexico, their sun-worship being their government. There are few, if any, evidences of habitation.

Metrical standard of the mound-builders, by the method of even divisors.

BY CHARLES WHITTLESEY OF CLEVELAND, O.

IN the absence of the author, an abstract of the paper was read by the secretary of the section. An endeavor was made, by the method named, to ascertain the standard of linear measurement which was used by the mound-builders. It is supposed that they, in common with other early races, used the length of some part of the human body as a linear unit. Several theories of the kind were tested mathematically, but, thus far, with only negative results.

The mound-builders identified.

BY JOHN CAMPBELL OF MONTREAL, CAN.

THIS paper was read by the secretary of the section, in the absence of the author.

It was a pains-taking attempt to trace the origin of the mound-builders in the eastern hemisphere, chiefly by means of a comparison of ancient languages along the line of a supposed route. The line of similarity was believed to indicate that the original people were Khitan or Khitos, Kathaei, Katei, Khilon, or Citem; and that they had made their way across Europe and northern Asia to Alaska, and thence to the United States, down the Mississippi valley, to Mexico.

Professor Mason, the president of the section, expressed the opinion that Professor Campbell was on the wrong track, while complimenting him upon his exceeding zeal and patience in his research. Professor Mason consoled himself, however, with the thought that the author had so thoroughly exhausted the subject that no one would ever attempt a similar experiment. Mr. D. A. Robertson of St. Paul differed from the president, and expressed the opinion that Professor Campbell was on the right track, and that the migration of the mound-builders would be traced from Siberia, or by the European isles, and, if not in one migration, in several.

Typical shapes among the emblematic mounds.

BY S. D. PEET OF CLINTON, WIS.

BY means of diagrams, the author exhibited the ground-outlines of different mounds which he had surveyed in Wisconsin, which showed that they had been made in the form of animals, in different postures. There were flying geese, eagles, jack-rabbits, panthers in the act of jumping upon their prey. Many of the supposed effigies were of great size, the tail of one squirrel having a length of three hundred feet. One of the mounds was in the shape of an elephant, with a very pronounced trunk. This mound, however, is now destroyed; and the

only authority for its existence is that of a man now dead. There were mounds, also, in the shape of water-animals, such as turtles, crawfish, etc. His theory of these mounds was, that the animals were supposed to be scattered about to guard the central sacrifice or altar mound. He was led to this belief by observing that the altar mounds are nearly always situated on high ground, overlooking a river, while the emblematic mounds are so disposed around the altar mounds, as to suggest the notion of guarding the latter.

Personal observations of the Missouri mounds from Omaha to St. Louis.

BY E. P. WEST.

IN the absence of the author, the paper was read by Dr. Case of Kansas City.

Observations were given with some detail, by which it appears that the Missouri mounds are built on the lower bluffs or terraces. The author shows also that these mounds must have been coeval with the loess deposits. He says we have reason to believe that the occupancy of the mound-builders was prior to the subsidence of the Missouri river and Kansas lakes, and that it was not continued long thereafter. It must have begun previous to the subsidence, since the remains and implements of this people are found in the undisturbed primitive deposits. Their ingress was probably from the south, and extended northward after the close of the glacial period. Turning northward after the close of the ice reign, they found the warm waters of the Champlain lakes filled with fish, inviting an occupancy along their hospitable shores. Here they erected their abodes, and drew their principal food-supply from the lakes. In time, owing to geological changes, the lakes were drained. The conditions for existence being altered, the lake-dwellers either suffered extinction, or were forced to change their mode of life. Their distinctive characteristics, at any rate, ceased long before the European touched foot on this continent. We have no means of knowing whether they were exterminated by neighboring nomadic tribes, or became themselves nomadic in their habits.

Game-drives among the emblematic mounds.

BY S. D. PEET OF CLINTON, WIS.

INDIAN mounds are divided by the author into five classes, as follows: 1. Emblematic, and built by hunters who worshipped animals. 2. Burial-mounds: this class mostly prevails in Michigan, Illinois, and Minnesota. 3. Mounds which are probably the remains of the stockades of an agricultural people. 4. Village mounds,—the remains of villages, and their high places for worship. 5. The peculiar mounds of the Pueblos and Aztecs.

The first of these classes was the special subject of the paper. The author's theory is, that the emblematic mounds, having the form of the animals hunted, served a useful, as well as a religious, purpose. He regards them as having been employed by the hunters as screens from behind which to shoot the ani-

mals which would pass along the game-drives between the mounds. Diagrams and charts were used to illustrate the theory.

(OTHER ANTHROPOLOGICAL PAPERS.)

In-door games of the Japanese.

BY E. S. MORSE OF SALEM, MASS.

IN introducing this subject, Mr. Morse said that there are curious affiliations between the Japanese and the American Indians, which may some time show a connection by family ties. Among the simple in-door games of the Japanese are some that are played with balls, jackstones, and cat's-cradle; but all these are more elaborate than with us, and the cat's-cradle goes through a far greater variety of changes. The author believes that the greater intricacy of Japanese simple games is due to the fact that older people take more interest in them. Among these games, there is one similar to 'Simon says thumbs up;' there are tricks with the hands, much like our own; and there are numerous games of striking hands, which appear easy, but require much practice to acquire adroitness. There are many games that test strength or endurance; among them are some in which ears and noses are pulled, and others where the competitors each hop on one foot, and try to push their rivals over.

They have a more elaborate game of checkers than ours. The pieces are placed on intersections instead of on squares. It frequently takes a month to play one game, and the players often deliberate over a move for an hour or two. Experts in the game acquire a wide reputation. Japanese chess is probably the most intricate game in the world. The board has 81 squares, and 20 pieces are used, which have moves somewhat like our own, though none are exactly similar. The pieces change in grade when they arrive at a certain position on the board. The strangest feature of the game is, that either player can take any piece which has been captured from him, replace it on the board, and use it against his adversary. This makes the game utterly bewildering to a foreigner.

The Japanese have no games with spotted and court cards like ours; but they have a card game of 'authors,' which compels players to cap verses of classic poetry. Mr. Morse was delighted to find this intellectual amusement a favorite with the Japanese; and he hopes they will never substitute for it our inferior struggles in seven-up, whist, and euchre.

Life among the Mohawks in the Catholic missions of Quebec province.

BY ERMINNIE A. SMITH OF JERSEY CITY, N.J.

THE paper was an interesting account of the Indians brought under Roman-Catholic influence by missionary labors continued through many generations. These Indians regard their priests as temporal directors as well as spiritual fathers. The manners and customs of the Indians were described, and some account was given of the studies of the author in the

Indian dialects of the province; noting, especially, the more curious peculiarities of the language, the dialectic differences of the tribes, and the modes in which such changes have been effected.

The principal occupation of the men is that of boatmen on the St. Lawrence, though the bead-work goods of the tribe are sold everywhere. The speaker detailed her exciting experience in shooting the rapids of the St. Lawrence, on a raft, under the skilful charge of these Indian boatmen. Many of the laws of the old aboriginal Mohawks are forgotten by the tribe described. The significance of some of the wampum-belts was outlined; and the speaker recited the legend of the old bell in the chapel, closing with a tribute to the zeal and the results of the labors of the old Catholic priests who have worked so long among these Indians.

An exhibition was made, in connection with the reading of the paper, of wampum-belts, drawings of ornaments, and the work of the earlier priests, including some literature.

Observations on the laws and privileges of the gens in Indian society.

BY ALICE C. FLETCHER OF NEW YORK.

THIS paper was read by the secretary of the section, in the absence of the author.

An elucidation of the customs and circumstances under which the gens system in Indian tribes supercedes parental ties, was the chief feature of this paper. The author had an excellent opportunity for observations of this character, during the work of placing the Omaha tribe of Indians upon their lands in severalty, and while adjusting the line of descent and inheritance according to our laws.

"A child who has lost its father or mother is considered an orphan. Its particular place is gone, and it passes into the gens." Beyond the foregoing statement, the paper does not make it quite clear, whether, in case of the death of the mother only, the child remains somewhat under direction of the father, or is wholly assigned to a family of the father's relatives.

But as to the results when the father dies, leaving offspring, the paper is quite explicit. In that case, the mother loses all maternal rights. Each child, unless of very tender age, will be separated from the mother, and will go into the family of some one of the father's relatives. It may thereafter be claimed as his own child by the male head of the family to which it has been allotted. This separation of her children from a widow is permanent. She usually marries again, and in that event is not burdened with her offspring by previous husband or husbands; but if she should remain unmarried, she would be expected to work for the family that has adopted her children, rather than for the children themselves. If she dies when her children are young, it is probable, that, at maturity, they will have forgotten even her name.

The women are not wanting in affection for the children of whom they are bereft; but the separation is looked upon as a matter of course, none of the

interested parties regarding it as a grievance, or even a hardship. It surprises an Indian to have the propriety of this arrangement questioned. No point of our law of inheritance is so difficult for him to understand, as that which binds together the child and the surviving parent.

Young men whose mothers are of the same gens are accounted brothers to each other, and the brothers of the mothers are uncles. Between these uncles and the nephews and neices, there is an easy familiarity, not unlike that of parents and children.

The author has observed a decided lack of family likeness among Indians. This observation applies, however, to entire families, which include cousins, aunts, and uncles; a striking resemblance between parents and children being not unusual.

The Indian may be 'the stoic of the woods;' but he is neither averse to pleasantries, nor deficient in sensitiveness of a certain kind. He delights in chaffing his fellow Indian; and dreads, more than aught else, being made a laughing-stock.

Symbolic earth formations.

BY ALICE C. FLETCHER OF NEW YORK.

THIS paper was read by the secretary of the section, in the absence of the author.

By the foregoing title, the author refers to certain heaps of earth which are piled up with care and formality during religious ceremonies of Indian tribes. Miss Fletcher has in previous papers described the preparation of these little mounds among the Sioux, where it formed part of every religious ceremony she witnessed. The present paper described this practice among the Winnebagoes in the 'buffalo-dance,' which is given by them four times in May and early June. The Winnebagoes, the author says, are admitted to be one of the older branches of the great family to which their tribe belongs. Their antiquity is shown by the construction of their language, by finding many religious ceremonies of different tribes referred to the Winnebagoes, and by Winnebago words used by other tribes in connection with religious ritual.

The buffalo-dance was described in detail. As the dancers enter, each woman brings in a handful of fine earth, and deposits it, so that two small mounds are raised midway between the eastern entrance and a fire which is about fifteen feet from the entrance. The mounds thus formed are truncated cones; and an old Indian said to Miss Fletcher, "That is the way all mounds were built: that is why we build so for the buffalo." The mounds were about four inches high, and not far from eighteen inches in diameter. When the mounds were completed, the head-gear of the four male dancers was placed upon them, consisting of claws, tails, and other trophies of the chase. The men imitate the buffalo in his wild tramping and roaring. The women follow in single file, each with her feet nearly straight and her heels together, propelling herself by a jerk of the body, or a kind of hop. The appearance of the entire line of female dancers is suggestive of the undulating movement of

a herd of buffaloes. The track left by the women's feet is a regular pattern like a close-leaved vine, each woman hopping exactly into her predecessor's footsteps.

The fire before referred to is built east of the centre of the tent, and contains four logs placed with their inner ends joining, and their outer ends toward the points of the compass. During the initiation of a candidate, at a certain point in the ceremony when he has fallen dead to the old life, and is raised to the new, the four logs are taken away, and the ashes are heaped in a sharply conical mound.

The essayist also described one of the sacred resting-places for spirits on the bluffs of the Missouri river. Such places are at intervals about fifty miles apart. They are cleared and cleaned by sacred hands every year. The place contained a depression in the ground, of circular form except as to an extension of the outline in an elongation or entrance exactly pointing to the east. The depression is just one foot in circumference, and about six inches deep. An adjoining tree, now partly blown down, has the reputation among Indians of being haunted by spirits. The author hoped that other observers would be able to trace the probable connection between these observances and the building of the larger mounds.

Osage war customs.

BY J. O. DORSEY OF WASHINGTON, D.C.

THE paper was read by the president of the section, in the absence of the author.

By means of an illustration the preparations were shown which the tribe makes for a war-march, the order followed being that of rank in the tribe. The paper described the tactics by which the Osages camp in a circle, the war-men on one side, and the non-combatants on the other. The road travelled by the Indians forms the line down through the centre of the camp, and the division-line. The great war-tent is placed with the rear to the west, the place of honor being at the east. The author detailed at considerable length, with the aid of illustrated charts, the method of selecting the forces, and the ceremonies preparatory to war, the decoration of the Kean Woctake, or Cheezhoe peacemaker, the form of the dance around the village, the nature of the moving dance, the order of march from home by twos, four abreast. Marriage ceremonials and funeral rites were also described and explained in detail. A marked feature of this paper was its use of drawings illustrating the grouping of participants in ceremonies.

The Charnay collection at Washington.

BY O. T. MASON OF WASHINGTON, D.C.

THE collection referred to contains the material obtained by the Charnay expedition to Mexico and Central America. The expenses of the expedition were defrayed by Mr. Pierre Lorillard. The author of the paper called attention to the fact that Mr. Lorillard was not himself proficient in any branch of

science. The success of the expedition showed how a gentleman of fortune might render valuable service to the cause of science, although not specially conversant with scientific lore.

In this expedition, a point was made by obtaining, as far as possible, casts (in plaster strengthened with tow) of the objects of antiquity. By means of these casts, the drawings of this and other exploring expeditions can be verified and corrected. Great success was attained, as to casts from little-known and almost inaccessible ruins; and many new objects of beauty and curiosity were brought to light, among them a large number of interesting reliefs and statues. The casts will be preserved in the museum at Washington, and in duplicate at the Trocadéro museum in Paris. Numerous photographs and drawings were obtained; and measures have been taken, under the auspices of the Smithsonian institution, to reproduce several of the more important ruins by correctly arranging the casts in position with suitable accessories. Good success has already been attained, both in making restorations of ancient temples and other ruins, and in correcting recorded measurements and drawings.

The correspondence between the prehistoric map of North America and the system of social development.

BY S. D. PEET OF CLINTON, WIS.

IN introductory remarks, the author claimed that the American continent was peculiarly favorable for the study of primitive life. The isolation of the continent, and the freedom from historical impressions, had contributed to a unique development. There is no trace of a Homeric age. The symbolism and mythology are homogeneous. In the eastern hemisphere, we have mountain ranges running east and west, which divided races: here we find little trace of such divisions, and the people were to be regarded as a unit.

The theory of the author was, that the development of the North-American aborigines depended upon their surroundings. Dividing the development into three successive grades of savagery, barbarism, and civilization, he found these in successive parallels from colder to warmer climates. The isothermal lines of this continent do not follow parallels of latitude; and due allowance must be made for their deflections to the north and south, in considering the effect of climate upon development. The author differed from Mr. Morgan on certain points. The production of pottery is not so certain an evidence of emergence from barbarism as is the pursuit of agriculture. While Mr. Morgan regarded the development of village-life as a distinguishing feature, Dr. Peet had found traces of village-life everywhere among the aborigines.

In respect to the origin of the American races, the author believed that some aboriginal tribes came from the east, and others from the west. It is possible that this diversity of descent can be detected by careful observation of the tribes on the Pacific coast.

The kitchens of the east.

BY E. S. MORSE OF SALEM, MASS.

THE author, during his travels in eastern Asia, had made some observations on the cooking-apparatus there in common use. The Japanese largely employ a mere fireplace, over which the vessels containing food are suspended by hooks: they have, however, two or three kinds of regular stoves of different designs. In China, stoves of a definite character are in use: one was found in Canton which was very elaborate; it was long, and had numerous openings. In Singapore, there appears to be only one kind of stove; and it is of decidedly primitive construction. In fact, it is little more than a rough trough filled with earth and sand, on which are laid rough stones selected with reference to pots of various sizes; and the fire is built among the stones. The kitchens in which these constructions are found are invariably very dark and dirty. In northern Java the author found a stove made of arched clay, as half an earthen pipe would be if cut through the axis of the cylinder. This half-cylinder is set with the open part down, and fire is built under its arch. Holes are cut through the crown of the arch, to hold some of the pots, while others are merely set upon the surface.

Methods of arrow release.

BY E. S. MORSE OF SALEM, MASS.

THE author recited the rules at present applied in the American system of archery; the bow being drawn with the right arm, the arrow being placed on the left side of the bow, and three fingers being used to hold the arrow. Among the Japanese, a different system prevails: the arrow is placed on the right side of the bow as it is held perpendicularly, and the drawing of the bow is performed with only the thumb and one finger on the shaft. China, Japan, and the Corea are alike in this manner of drawing the bow. Among Indian tribes, the methods of arrow-release differ very widely. In general it may be stated that our system of arrow-release (which the author designated as the Saxon method) is substantially the same as that of the majority of European races, the modifications of the system among them not being important.

The Japanese use a glove with a heavy thumb, and sometimes a heavy ring on the thumb. Mr. Morse exhibited the Japanese archery-glove. It has a filling of wood and pitch in the thumb, which aids in grasping the arrow. He considered this glove the best of its kind.

Our system of three-finger release is certainly as good as any other, and probably is the best. With this system our archers—for instance, some in Ohio—are able to outshoot any Indian, tried by all the usual tests. As to the methods of stringing the bow, the author had not been able to find much uniformity. A number of different modes were exhibited.

Vestiges of glacial man in central Minnesota.

BY FRANC E. BABBITT OF LITTLE FALLS, MINN.

IN the absence of the author, this paper was read by Mr. Upton.

The field of the discoveries detailed in this paper lies on the bank of the Mississippi river, in central Minnesota, about one hundred miles north-west of St. Paul, and within the township and village of Little Falls, Morrison county. In his report for 1877, Prof. N. H. Winchell, state geologist of Minnesota, described certain rudely worked pieces of quartz discovered by him in this locality. The author of this paper describes a discovery of worked bits of quartz in a much older stratum than the one explored by Professor Winchell.

Fragments of sharp, opaque quartz were found by the author in 1879, in a gap or notch, cut by drainage, in an ancient river-terrace, which has an elevation of twenty-five feet above the present river. The gap had been deepened by use as a wagon-track, which has latterly become a highway. Ultimately the source of these fragments was traced, and found in the form of a thin layer, situated from ten inches to two feet above the point in the notch where Miss Babbitt began her discoveries.

The ancient terrace consists of stratified gravel and sand. The layer of quartz-chips extended in a nearly horizontal plane into the terrace, and was partially broken up on the edge where the gap, with its wagon-road, had disturbed a portion. Both the inferior and superior planes of the quartz-bearing stratum were sharply defined: its thickness averaged a few inches, varying a little with the size of included pieces. The quartz-bed rested upon a few inches of sandy soil, which passed downward into a coarse water-worn gravel immediately overlying till. Above the quartz-bed, stratified gravel and sand extend up to the surface of the terrace, which is twelve to fifteen feet higher than the plane of the quartz. The pebbles of the gravel lying directly on the quartz were small well-rounded, and less angular than those of the gravel below. These observations show that the quartz-chips were spread originally upon an ancient surface that was afterward covered deeply by the modified drift that forms the terrace. The quartz-chips and implements discovered by Dr. Winchell were in the upper stratum of the terrace-plain. The two sets of objects cannot be synchronous in deposit: between the periods when they were left there, an interval of time must have passed sufficient for the deposit of twelve or fifteen feet of modified drift.

The specimens are mostly small, and very numerous. Among them are some of a type unknown to the author, of which the most finished have delicate, fragile edges, formed by a single thin leaf of the quartz prolonged beyond the mass of the object in a series of minute, irregular notches. The specimens of different types were found in groups, each of its own type, in this deposit. Some are thus described: 'Axe-like quartzes,' 'rasping-stones,' 'long prong-shaped objects,' 'hammer-stones of different shapes, sharp pieces adaptable as cutting-blades, and

a great many sharp and long splinters.' They are made of many different varieties of the quartz mineral; but the greater part appears to have been taken from quartz-bearing slate in the vicinity. Numbers have evidently been formed from water-worn pebbles. Objects shaped from some special variety or tint of quartz were found generally together in loose groups of two or three to a dozen pieces. Where a piece is of large size, the chips surrounding it are usually much smaller.

Professor Henry W. Haynes of Boston, to whom a collection of the specimens was submitted, has written, that he believes some of them to be implements; many, chips and refuse struck off in the work; many are natural forms, and a few are rolled pebbles. Those which he thinks are implements, he supposes were held in the hand of the workman; masses of quartz were fitted for use by having most of their projections battered off by another stone. He believes, also, that he has found traces of moss or leaves being used to soften the roughness of these implements when held in the hand.

Mr. Warren Upham, assistant of the state geological survey, contributed the following statement on the subject, showing how man could live while the modified drift was deposited, and how relics of his work might be enclosed within that formation. He says, —

"As soon as the ice had so far retreated as to uncover the present valley of the Mississippi river in Morrison county, the deposition of the modified drift, constituting the terrace-plain in which are found the quartz chippings, ensued, during the continued retreat of the ice. It seems very probable, that vegetation and animals followed close upon the retiring ice-border; and that even man, who lived near the Atlantic coast in this closing stage of the glacial period, as abundantly proved by recent discoveries in the drift-gravel near Trenton, N.J., may also have lived here at that time, and occupied the Mississippi valley directly after the ice-sheet retired. While the deposition of the valley-drift at Little Falls was still going forward, men may have lived there, and left, as the remnants of their manufacture of stone implements, the multitude of quartz fragments here described. By the continued deposition of the modified drift, lifting the river upon the surface of its glacial flood-plain, these quartz-chips were deeply buried in that formation. The date of this valley-drift must be that of the retreat of the ice of the last glacial epoch, from whose melting were supplied both this sediment and the floods by which it was brought. The glacial flood-plain, beneath whose surface the quartz-fragments occur, was deposited in the same manner as additions are now made to the surface of the bottom-land; but the flooded condition of the river, by which this is done, was doubtless maintained through all the warm portion of the year, while the ice-sheet was being melted away upon the region of its head waters. In spring, autumn, and winter, or, in exceptional years, through much of the summer, it seems probable that the river was confined to a channel, being of insufficient volume to cover its

flood-plain. At such a time this plain seems to have been the site of human habitations and industry, as shown in this paper. After the complete disappearance of the ice from the basin of the upper Mississippi, the supply of both water and sediment was so diminished that the river, from that time till now, has been occupied more in erosion than in deposition, and has cut its channel far below the level at which it then flowed, excavating and carrying to the Gulf of Mexico a great part of its glacial flood-plain, the remnants of which are seen as high terraces or plains upon each side of the river."

An animated discussion followed the reading of Miss Babbitt's paper. Mr. Putnam referred briefly to the discoveries made by Dr. Abbott in New Jersey, some of which are unquestionably artificial productions, and prove that man resided in that region prior to the last glacial deposit, or, as some claim, between two glacial deposits. The discoveries made here seem to be of the same character as those in New Jersey. Their age belongs to geologists to ascertain. He considered the discovery very important, and the paper one of great value. Rev. Mr. Peet took issue with Mr. Putnam as to the value of the discoveries, and thought, that, if paleotiths had to depend upon such a shallow foundation as was furnished by these alleged discoveries, the matter would better be dropped. He thought there was absolutely no evidence that the specimens discovered by Miss Babbitt were the work of man, and was of the opinion that the whole theory was without any foundation whatever.

A classification of the sciences.

BY J. W. POWELL OF WASHINGTON, D.C.

THIS is an endeavor to classify sciences in the order of the evolution of phenomena, and with reference to complexity. The first group of science, relating to physics, the author divided into molecular, stellar, and mechanical science. In the second group, the biological sciences, he placed botany and zoology. In the third group, anthropology, we have psychology, sociology, philology, technology, and philosophy. Geology is a compound of the first group; paleontology, of the second.

The following subdivisions of the third group were suggested: As branches of philology: 1. sign language; 2. spoken language; 3. written language. Under technology: 1. activital; 2. regulative; 3. ethics. Under philosophy: 1. mythology; 2. metaphysic; 3. scientific. Technology is also either industrial or aesthetic. The author explained in further detail the reasons for this order of classification, and the relations of the members of different groups to each other.

List of other papers.

THE following additional papers were read in this section, some of them by title only: An ancient village of the emblematic mound-builders; caches guarded by effigies; effigies guarding the village and sacrificial places not far away; high places connected

with ancient villages; The religious structures common to villages in prehistoric time, by *S. D. Peet*. An abnormal human skull from a stone grave in Tennessee; A new stand for mounting skulls, devised

by *E. E. Chick*, by *F. W. Putnam*. Accidents, or mode-signs of verbs in the Iroquois dialects; Studies in the Iroquois concerning the verb 'to be,' and its substitutes, by *Erminie A. Smith*.

PROCEEDINGS OF SECTION I.—ECONOMIC SCIENCE AND STATISTICS.

ADDRESS OF FRANKLIN B. HOUGH OF LOWVILLE, N. Y., VICE-PRESIDENT OF THE SECTION, AUG. 15, 1883.

THE METHODS OF STATISTICS.

I INVITE your attention to a few thoughts upon the *methods of statistics*—using the term 'statistics' in its broadest sense, as a 'statement of facts.'

The subject naturally divides itself into two distinct operations,—the collection of the data from which information is to be obtained, and their classification in a manner that shall without error, and with the least labor, present the results in a form most convenient for use.

Commencing with the first of these,—the collection of facts,—it would be needless to remark, that every thing depends upon the simplicity, accuracy, and completeness with which they are obtained, and that by no subsequent operation can their errors be eliminated, or their deficiencies satisfactorily supplied.

It may be remarked, in general, that no intelligent person, business firm, or corporation, can safely begin any enterprise,—nor can any government, from the lowest municipal to the highest national form, undertake any measure with prudence,—without first knowing all that can be ascertained beforehand concerning it.

In private business, inquiries are naturally made as to the cost and the profits. If it requires the use of a raw material, the parties will endeavor to make themselves sure as to its abundance,—the probability that the supply will be maintained,—or, if it be of limited amount, the quantity, and the time that it will hold out. They will need to know the changes that may happen in amount, quality, and cost; and similar inquiries will be made as to the expenses that may be incurred while in their hands,—the chances of loss, or of change in value,—and, finally, the extent of the demand for whatever may be the product of their skill, industry, and investment, its probable permanence, and its tendencies to change.

These questions, being well considered in the beginning, will enable the careful operator to avoid losses from imprudent investment, from over-supply of the markets, or from the depression of receipts below the limits of cost.

By a train of reasoning analogous to this, those intrusted with the government of towns, cities, or states, may determine as to how far the cost and maintenance of public enterprises will be justified by the results; but with this difference, that the benefits or profits, instead of being measured by a money value, are often to be found in an advancement of

the public welfare, and in the security, convenience, and prosperity that may ensue.

But, whether in private enterprise or public undertaking, we may attribute success alike, in both, to an attentive notice of the facts and the circumstances upon which they depend; and, if loss or failure follow, the reasons may very generally be traced to ignorance or inattention as to the facts and probabilities that should have been known beforehand.

These thoughts lead us directly to the point we are first to consider; viz., How shall the knowledge of the required information be obtained? In the primitive way (and for a small business this may be the best one), the person will, from his own observation, 'look over the ground,' and consider the various points to be taken into the account. He will make inquiries of others, as to the supply, demand, prospects of competition, and the like; and thus accumulate a certain amount of information, upon the extent and accuracy of which, his success or failure will in a great degree depend.

Advancing a step farther, we find, in most great industries and interests of the country, that those in the same business or pursuit, whether in the arts or sciences, or in financial operations, however they may be influenced by local rivalries or petty jealousies, are constantly tending to the formation of associations or societies, for the advancement of their common interests. They meet for the discussion of methods by which expenses may be saved, or profits increased. They inquire of one another as to their experience or observation upon doubtful points. They seek to gather light and aid from science, to stimulate and reward invention, and to excite rivalries in the comparison of improved products. They discuss financial and national questions that may affect their welfare; and not unfrequently they appoint committees or agents, from their own number, to gather statistical facts and details for their own use and guidance.

We consider the information thus obtained, as deserving high rank in point of accuracy. It is chiefly taken from records, without a motive for concealment or evasion, and with a full knowledge that self-deception and loss would result from error, whether above or below the truth.

From this combined experience, each member who participates obtains a standard for comparing his own results with the general average. He cannot afford to fall below it, and he has the strongest motives for reaching the highest limits that have been reached by others.

Still these statistics, however accurate they may be, are necessarily special, and often technical in their nature. They cannot be compared with those